SECTION A. General description of project activity

A.1 . Title of the project activity:

Title: **Shenzhen Xiaping Landfill Gas Collection and Utilization Project**
Version number of the document: 8
Date: Mar. 20, 2008

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

ACM0001--"Consolidated monitoring methodology for landfill gas project activities" (version 4). This consolidated monitoring methodology is based on elements from AM0002, AM0003, AM0010, AM0011. For more information regarding the methodology please refer to http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html.

AMS-I.D.--"Grid connected renewable electricity generation" (version 9). For more information regarding the methodology please refer to http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html.

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

The approved ACM0001 monitoring methodology shall be used in conjunction with the approved ACM0001 baseline methodology, which has been adopted by the Proposed Project.

The methodology ACM0001 is applicable to landfill gas capture project activities, where the baseline scenario is the partial or total atmospheric release of the gas and the project activities include situations as:

a) The captured gas is flared; or
b) The captured gas is used to produce energy (e.g. electricity/thermal energy), but no emission reductions are claimed for displacing or avoiding energy from other sources; or
c) The captured gas is used to produce energy (e.g. electricity/thermal energy), and emission reductions are claimed for displacing or avoiding energy generation from other sources.

As previously described, the Proposed Project includes two complementary activities, as follows:

- Collection and combustion of landfill gas, of which the methane will be converted into carbon neutral CO_2; and
- Supply of electricity generated by LFG combustion to South China Power Grid, which consequently reduce GHG emissions by displacing electricity generated by fossil fuel fired power plants.

The project fulfils the conditions of Option c) (i.e. the captured land fill gas is directly flared or used to produce energy and part of the credits from displacing grid electricity is claimed) so that ACM0001 monitoring methodology was considered the most appropriate methodology for the Proposed Project.

Additionally, the capacity of LFG power plant is lower than 15 MW, therefore, AMS-I.D. monitoring methodology is applied as well to the Proposed Project.

In line with ACM0001 monitoring methodology, Option 2 is chosen as the monitoring method.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

Not applicable.

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:								
ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1. $LFG_{total,y}$	Total amount of LFG captured	Measured by Flowmeter A and Flowmeter B according to revision , i.e. $LFG_{total,y}$ is the sum of the two flow rates.	m^3	m	Continuously	100%	electronic	Data to be aggregated monthly and yearly.
2. $Q_{flared,y}$	Amount of gas flared	Measured by flow meter	m^3	m	Continuously	100%	electronic	Data to be aggregated monthly and yearly.
3. $Q_{electricity,y}$	Amount of LFG used in power generation	Measured by flow meter	m^3	m	Continuously	100%	electronic	Data to be aggregated monthly and yearly.
4. *FE*	Flare/combustion efficiency, determined by the operation hours (1) and the methane content in the exhaust gas (2)	Measured by gas quality analyzer and flame detector	%	m	Enclosed flare is adopted in the proposed project therefore, flare efficiency will be measured yearly, with the first measurement to be made at the time of installation	n/a	electronic	(1) Flare used in the Project is an enclosed flare (2) Methane content of flare exhaust gas will be measured annually. (3) The operation time of flare will be measured continuously by a run time flame detector (4) The enclosed flares shall be operated and maintained as per the specifications prescribed by the manufacturer.

5. $w_{LFG,CH4,y}$	Methane fraction of LFG	Measured by gas quality analyzer	CH_4 %	m	Continuously/periodically	100%	electronic	Data to be aggregated monthly and yearly.
6. *T*	Temperature of LFG	Measured by online temperature sensor	°C	m	Continuously/periodically	100%	electronic	No separate monitoring of temperature is necessary because flow meters used in the Project all measure temperature and pressure automatically.
7. *P*	Pressure of LFG	Measured by online pressure sensor	Pa	m	Continuously/periodically	100%	electronic	No separate monitoring of pressure is necessary because flow meters used in the Project all measure temperature and pressure automatically.
8. $EL_{EX,LFG}$	Total amount of electricity exported out of the project.	Measured by ammeter	MWh	m	Continuously	100%	electronic	Required to estimate the emission reductions from electricity generation from LFG.
9. EL_{IMP}	Total amount of electricity imported to meet project requirement.	Measured by ammeter	MWh	m	Continuously	100%	electronic	Required to determine CO2 emissions from use of electricity or other energy carriers to operate the project activity. The records of any electricity imported in the baseline too should be recorded at the start of project.
10	Regulatory requirements relating to LFG projects	www.es.org.cn www.szepb.gov.cn	Test	n/a	annually	100%	electronic	Required for any changes to the adjustment factor (AF) or directly $MD_{reg,y}$
11	Operation of the energy plant	Operation records	Hours	m	annually	100%	electronic	This is monitored to ensure methane destruction is claimed for methane used in electricity plant when it is operational.

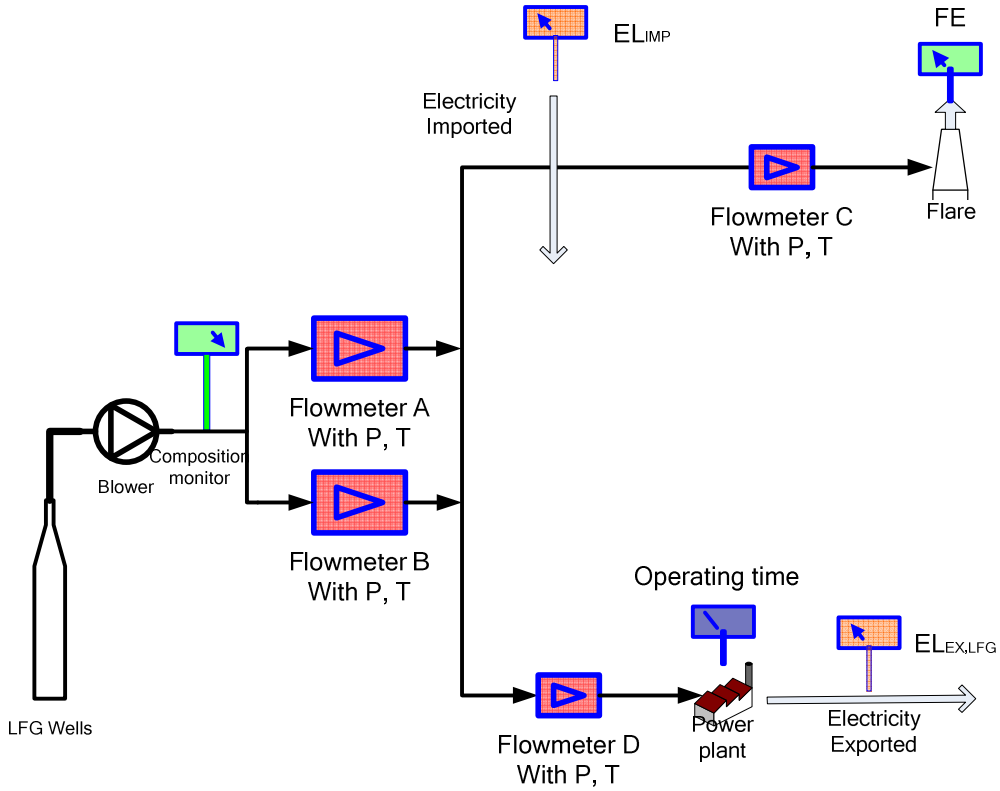

Figure 4. Schematic of Monitoring Parameters and Monitoring Points（revised according to revision）

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

The emission reduction of the Proposed Project will be monitored directly, therefore it needs not to monitor and calculate the project emission. In that case, no formula used to calculate project emission will be provided here, instead, the formula used to calculate emission reduction directly will be provided in D.2.4.

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

No leakage effects need to be accounted under this methodology.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

No leakage effects need to be accounted under this methodology.

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

$$ER_y = \left(MD_{project,y} - MD_{reg,y}\right) * GWP_{CH4} + EL_y * CEF_{electricity,y} \quad (1)$$

The above equation is that of the Consolidated Methodology for Landfill Project ACM0001, where:

ER_y : GHG emission reduction achieved by the project activity during a given year "y" (tCO_2e);

$MD_{project,y}$: Amount of methane actually destroyed/combusted during the year "y" (tCH_4);

$MD_{reg,y}$: Amount of methane that would have been destroyed/combusted during the year "y" in the absence of the Proposed Project activity (tCH_4);

GWP_{CH4} : Approved Global Warming Potential value for methane ($21tCO_2e/t\ CH_4$);

EL_y : Net quantity of electricity displaced during the year "y", in megawatt hours(MWh);

$CEF_{electricity,y}$: CO_2 emissions intensity of the electricity displaced during the year "y" (tCO_2e/MWh);

$$EL_y = EL_{EX,LFG} - EL_{IMP} \quad (1a)$$

Where:

$EL_{EX,LFG}$:net quantity of electricity exported during year y, produced using landfill gas, in megawatt hours (MWh).

EL_{IMP} :net incremental electricity imported, defined as difference of project imports less any imports of electricity in the baseline, to meet the project requirements, in MWh.

Since there is no regulatory or contractual requirement for landfill operator to specify $MD_{reg,y}$, an "Adjustment Factor" (AF) is used to consider the amount of methane destroyed in the baseline scenario as follows:

$$MD_{reg,y} = MD_{project,y} * AF \quad (2)$$

For the Proposed Project, an AF of 0% will be used to account for any self burning that may occur in Xiaping landfill, or at similar landfills in China that are not CDM projects. As stipulated in the Monitoring Plan, the sites in China and relative regulatory requirements will be monitored annually. If the situation changes for similar landfills, the AF will be increased to take the changed situation into consideration in the calculation of the CERs from the Proposed Project.

The methane destroyed by the project activity ($MD_{project,y}$) during a year is determined by monitoring the quantity of methane actually flared and gas used to generate electricity.

$$MD_{project,y} = MD_{flared,y} + MD_{electricity,y} \quad (3)$$

$$MD_{flared,y} = Q_{flared,y} * w_{LFG \cdot CH4,y} * D_{CH4} * FE \quad (4)$$

Where $MD_{flared,y}$ is the quantity of methane destroyed by flaring, $Q_{flared,y}$ is the quantity of LFG flared measured in cubic meters (m^3), $w_{LFG \cdot CH4,y}$ is the methane fraction of the LFG and expressed as a fraction (in m^3 CH_4 / m^3 LFG), FE is the flare efficiency and D_{CH4} is the methane density expressed in tonnes of methane per cubic meter of methane (tCH_4/m^3CH4).

$$MD_{electricity,y} = Q_{electricity,y} * w_{LFG \cdot CH4,y} * D_{CH4} \quad (5)$$

Where $MD_{electricity,y}$ is the quantity of methane destroyed by generation of electricity and $Q_{electricity,y}$ is

the quantity of landfill gas fed into electricity generator. $w_{LFG,CH4,y}$ is the methane fraction of the LFG and expressed as a fraction (in m^3 CH_4 / m^3 LFG)

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.
D.2.2.1-1 $LFG_{total,y}$	Low	Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy.
D.2.2.1-2 $Q_{flared,y}$	Low	Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy.
D2.2.1-3 $Q_{electricity,y}$	Low	Flow meters will be subject to a regular maintenance and testing regime to ensure accuracy.
D2.2.1-4 FE	Medium	Regular maintenance will ensure optimal operation of flares. Flare efficiency should be checked yearly. The enclosed flares shall be operated and maintained as per the specifications prescribed by the manufacturer.
D2.2.1-5 $w_{LFG,CH4,y}$	Low	The gas analyzer should be subject to a regular maintenance and testing regime to ensure accuracy.
D2.2.1-6 T	Low	The temperature sensors in flow meters should be subject to a regular maintenance and testing regime to ensure accuracy
D2.2.1-7 P	Low	The pressure sensors in flow meters should be subject to a regular maintenance and testing regime to ensure accuracy
D2.2.1-8. $EL_{EX,LFG}$	Low	The ammeter should be subject to a regular maintenance and testing regime to ensure accuracy
D2.2.1-9. EL_{IMP}	Low	The ammeter should be subject to a regular maintenance and testing regime to ensure accuracy

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

The Organization Chart in Figure 4 shows the management structure that the project owner will use for organizing and operating the Proposed Project.

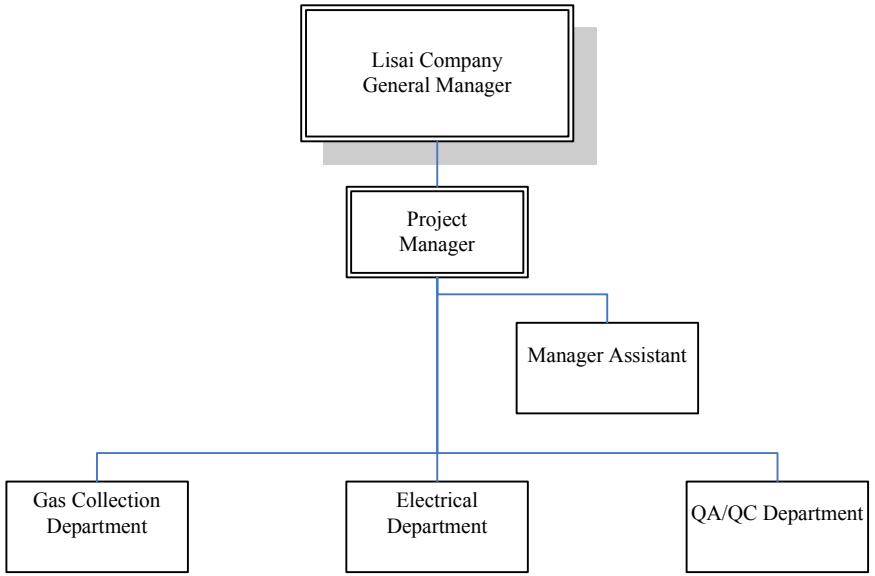

Figure 4. Organization and Management Structure for the Proposed Project

The project owner had designated Mr. Zhang Guangyu, General Manager of Shenzhen Lisai Development Co., Ltd to be responsible for monitoring activities. He is in charge of the whole project including construction, operating and management. He will ensure:

- Installation of proven and qualified monitor equipment including flow meter and gas quality analyzer.
- Construct a central control system which is connected with each of monitor equipment. The system will allow automated and continuous recording and reporting of data. The readings will be checked for any anomalies before being filed for future reference.
- Appoint qualified technicians to monitor and record data according to the monitoring plan. All the technicians will receive proper training to ensure they understand their specific tasks and handling of equipment. The records will be double checked by QA/QC Department that will be responsible for accuracy and frequency of the measurements.
- Document data both in electronic version and hard copy in a transparent system. Manager Assistant will document all data and write periodical Operation Report.
- Receipt of electricity purchase will be obtained.
- Project owner will prepare verification report required by DOE and carbon buyers according to CDM rules and ERPA. Proper management process and routine procedures will be put in place to ensure the quality of reports. In the case of non-conformities in the implementation of the Proposed Project with relation to the monitoring plan, an analysis of non-conformity and its causes will be carried out immediately and corrective actions will be implemented.

A training program for each department, engineer and operator will be provided before assuming responsibility for the LFG recovery and utilization operations. This training program will cover:

- General CDM project knowledge
- general technology of LFG generation, safety of gas handling in equipment and problems with uncontrolled emissions
- specific operating knowledge for each department
- QA/QC program
- Emergency plans

D.5 Name of person/entity determining the monitoring methodology:

The monitoring plan study of the Proposed Project was completed on 20 May 2006 by Mr. Deng Zhou, Sowertech Co. Ltd, and supported by Ms. Pan Tao, Global Climate Change Institute, Tsinghua University.

The study of baseline and monitoring plan received a great support from Mr. Zhang Guangyu, General manager of Shenzhen Lisai Development Co., Ltd, Mr. Yang Zhigui, Chief Engineer of Shenzhen Xiaping Landfill and Prof. Wang Wei, Department of Environmental Science and Engineering, Tsinghua University.